

A Celebration of Abundance:  
Something Lived,  
Something Dreamed

William McDonough + Partners  
MBDC  
VantagePoint Venture Partners



Design is the first signal of human  
intention

What is our intention as a species?

What is the first question?

How do we love all the children of  
all species for all time?

Our goal is a delightfully diverse, safe, healthy and just world, with clean air, water, soil and power — economically, equitably, ecologically and elegantly enjoyed.







Guardian / Commerce

A regulation is a signal of design failure.

Becoming native to place











Being less bad  
is not being good



How does California welcome  
10 million more people by  
2020?

Growth is good

$$E = mc^2$$

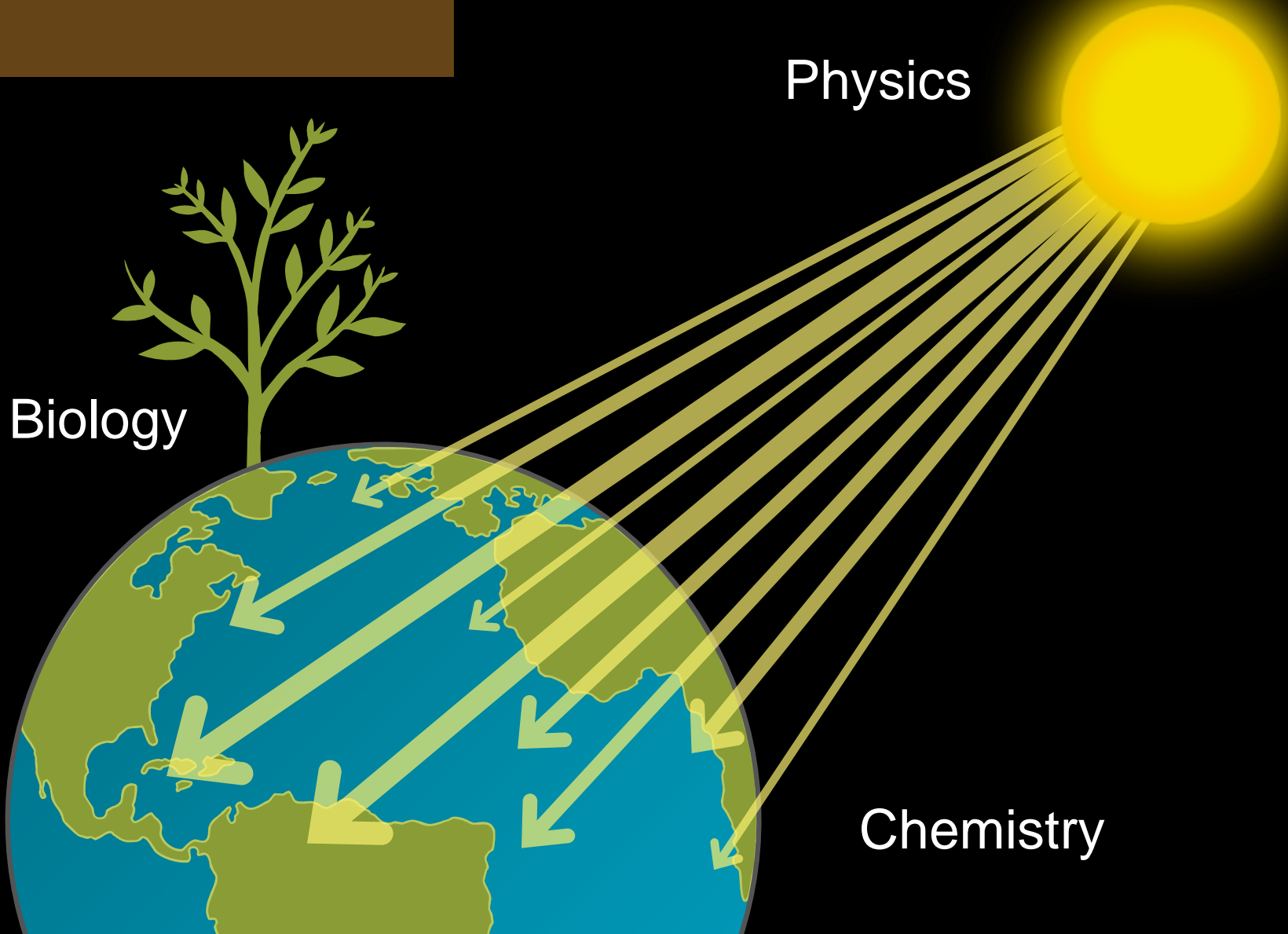


$$E = mc^2$$

Physics

Biology

Chemistry



Could human artifice be a living thing?

Growth

Free Energy From Sunlight

Open Metabolism

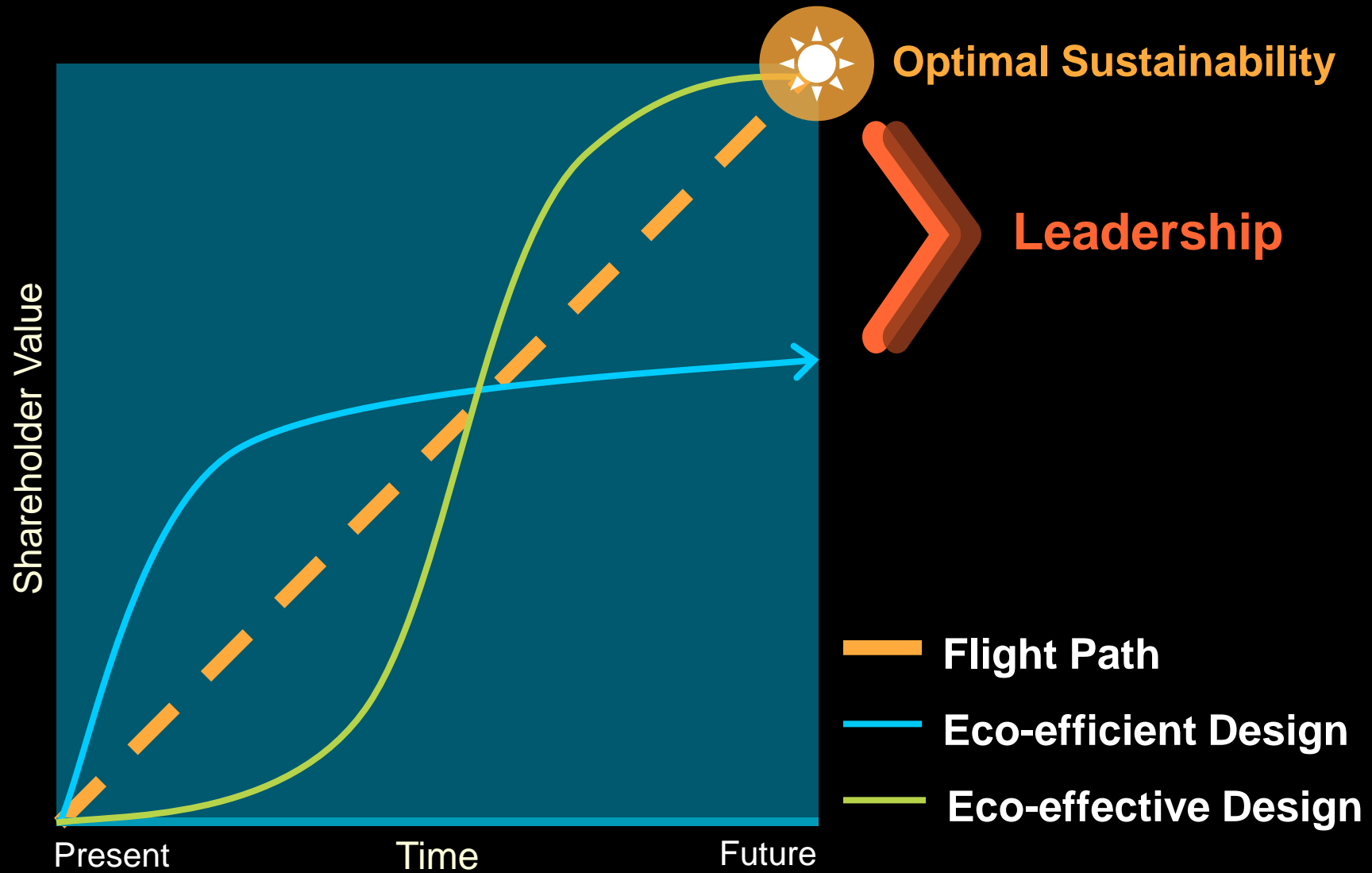
The question then is no longer:  
“Growth or no growth?”

but “What do we want to grow?”



Prosperity  
Health  
Security  
Community  
Peace  
Culture

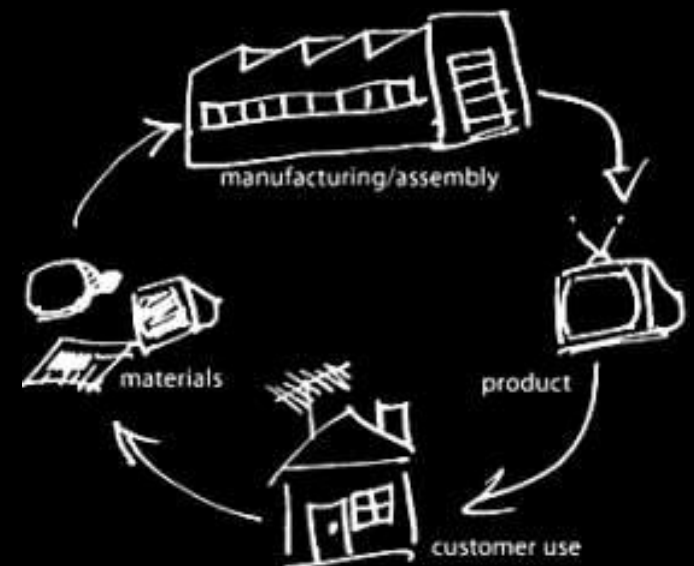
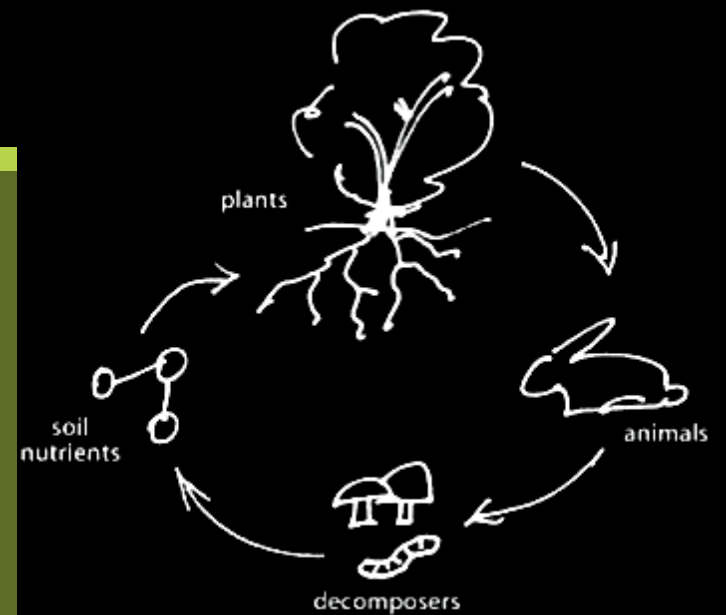
What is our target?  
What is our trajectory?



What is eco-effective design?

# Nature's Design Principles

Waste equals food



# Nature's Design Principles

Waste equals food

Use current solar income

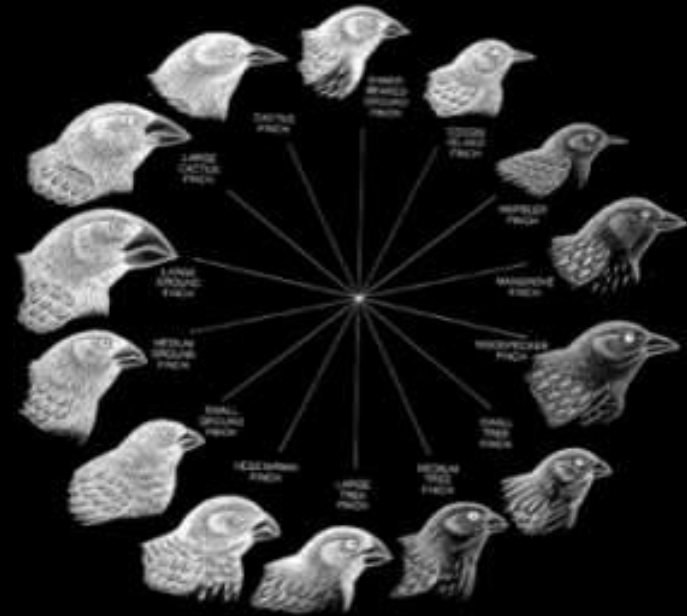


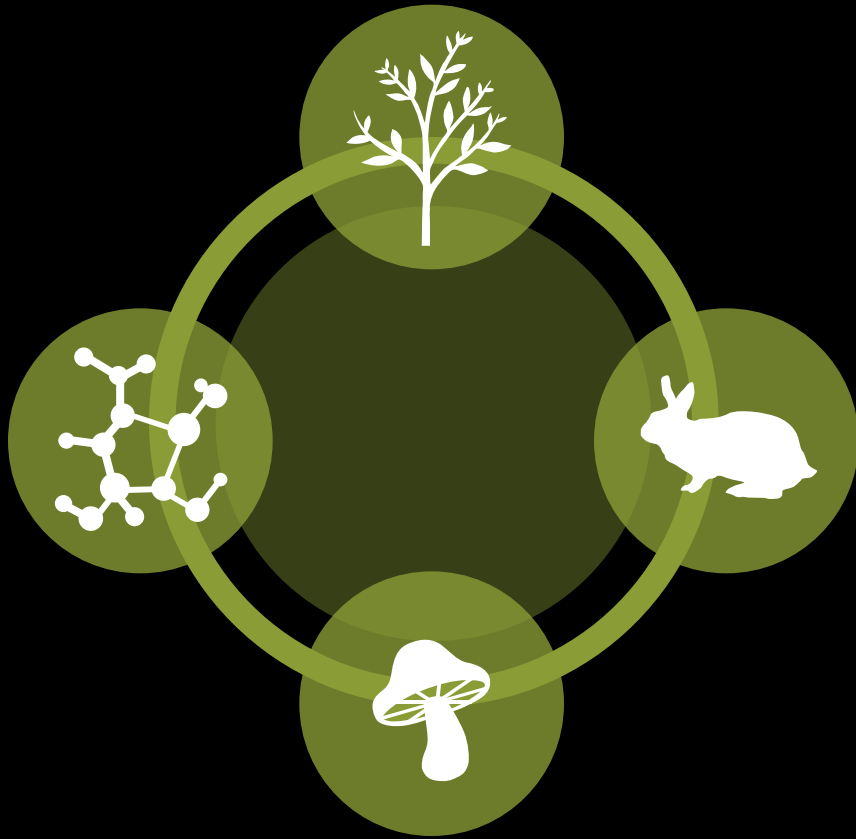
# Nature's Design Principles

Waste equals food

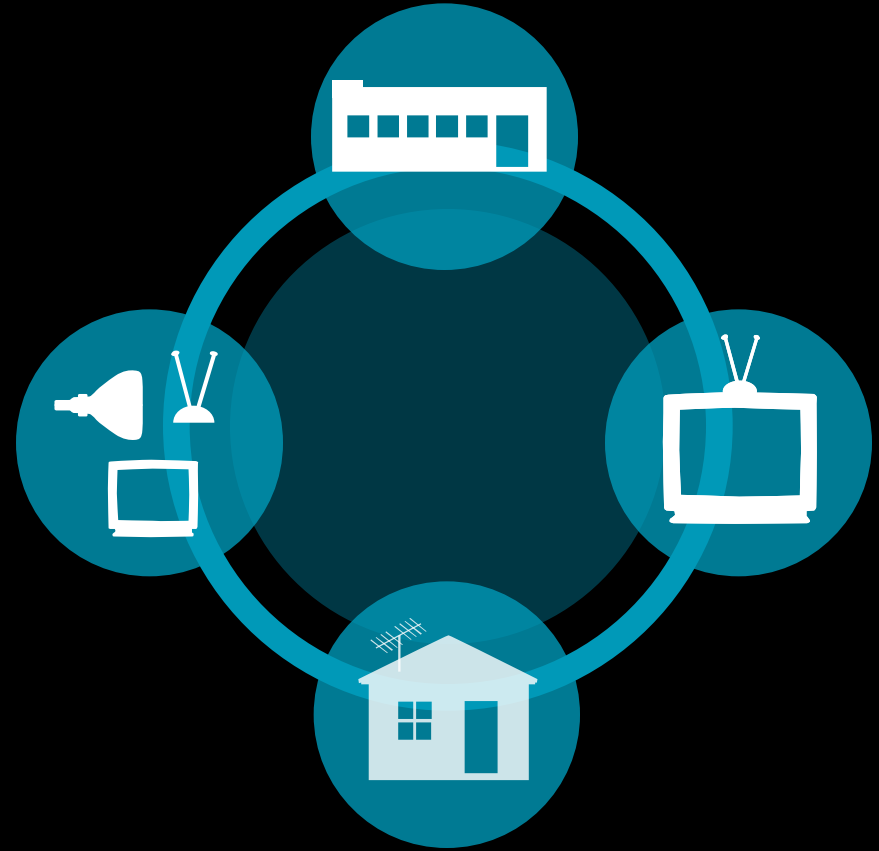
Use current solar income

Celebrate diversity





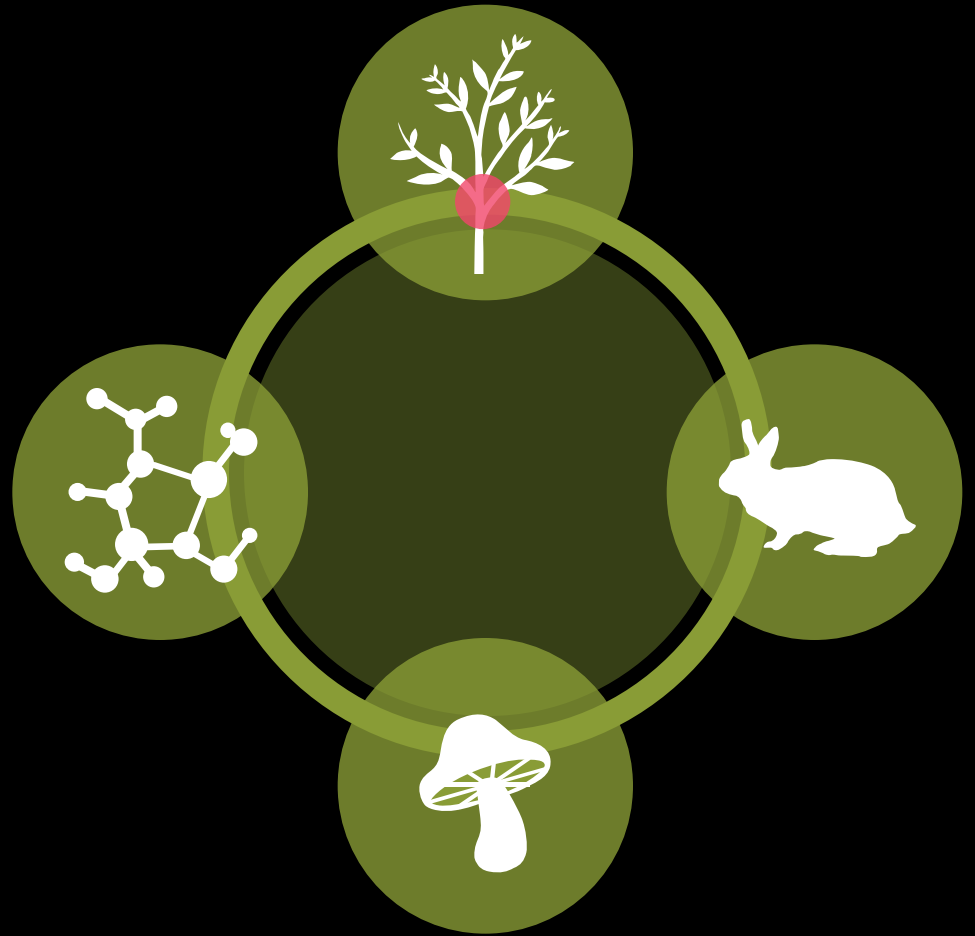
Biological  
Metabolism



Technical  
Metabolism



# Biological Nutrient



# Technical Nutrient



# Cradle to Cradle: from molecule to region

A photograph of a modern interior space. In the foreground, a hallway with a red carpet leads towards a dining area. The walls are a light, neutral color. On the left wall of the hallway, several small framed pictures are displayed. The dining area, visible through an open doorway, features a wooden dining table and chairs. The ceiling is white with exposed wooden beams and modern lighting fixtures. A large, semi-transparent red banner is overlaid on the right side of the image, containing the text "EDF 1984" in white. The bottom portion of the image is a dark, reflective surface that mirrors the scene above.

EDF 1984

“It’s proprietary.  
It’s legal.  
Go away.”

- Building Material Supplier

## IS YOUR OFFICE KILLING YOU?

The  
dangers  
of sick  
buildings

By Michelle Conlin

PAGE 114



May 6, 2001

McDonough, Braungart Design  
Attn: Jason Gillian  
Tel. 804/245-0057 Ext. 226  
Fax. 804/295-1500

Dear Mr. Gillian:

Our crews do carry MSDS sheets in our trucks when we are traveling to a job site, as we are required to for DOT purposes. These MSDS sheets (required for shipping purposes) are provided by the materials manufacturer, but do not include all of the chemical components mixed into the raw materials. Only the major components that are above the thresholds for reportable quantities are included. I assure you that we do not know all of the

purposes. These MSDS sheets (required for shipping purposes) are provided by the materials manufacturer, but do not include all of the chemical components mixed into the raw materials. Only the major components that are above the thresholds for reportable quantities are included. I assure you that we do not know all of the components of the formulations that comprise the [redacted] systems that we buy. Many

industry by using a sophisticated metering system that monitors our ratio, temperatures, and output. This computerized system instantly warns our trained technicians if the equipment is varying from the ideal processing parameters, and then shuts down the equipment if a set-point is reached that is not within the limits specified by the manufacturer to assure product quality.

We are also diligent about selecting the appropriate foam system for the applications we are asked to work on. An understanding of the building science issues related to each installation is key to selecting the correct properties of the foam system we recommend and use on each project. Variables we consider include:

  
Agnew Farm Products  
Allen Memorial Art  
Museum  
Ben & Jerry's  
Britton Woods Resort  
Brattleboro Water  
Authority  
Britton Lumber  
Bombardier Building  
Brace Museum  
Building Science Corp  
BLL/Franklin Square  
Calco, Inc.  
Cannon Mountain  
Cider Mill Pub  
Clough Honey Prods.  
Conklin Farms  
Cortini Inn  
Cox Company, Inc.  
Crews, Inc.  
Curtier Gallery of Art  
Dartmouth College

Deerfield College  
Oheas Resort  
Pico Resort  
Process Engineering  
Ripon Art Gallery  
Russell P. Memorial  
Flower Library  
Sioux Resort  
Timber and Rogers  
Waterville Valley  
Wells Reserve  
Weweth Corporation  
Winnsboro Hydro  
U.S. Cold Regions  
Research Est. Labs

# WARNING:

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PROPOSITION 65 Warning: The State Of California Requires That We Warn You That The Property Contains Chemicals Known To The State Of California To Cause Cancer, and Birth Defects, and Other Reproductive Harm. These Chemicals May Be Contained In Emissions and Fumes From Building Materials, Products and Materials Used To Maintain The Property, and Emissions, Fumes, and Smoke From Tenant and Guest Activities, Including But Not Limited To The Use Of Motor Vehicles, and Tobacco Products. These Chemicals May Include, But Are Not Limited To Carbon Monoxide, Formaldehyde, Tobacco Smoke, Unleaded Gasoline, Soots, Tars, and Mineral Oils.

CALIFORNIA HEALTH AND SAFETY CODE SEC. 25249.6 AND 25249.11



# State of California Green Chemistry Initiative

California spent \$130M to manage hazardous waste (2006-07)

Preventable, chronic diseases from workplace chemical exposures affected 200,000 Californians; 4,400 deaths (2004)

Prevent hazardous substances, versus manage risks

# Material Selection

- Currently: Restricted substances (Prop 65)
- Next step: Full inventory and assessment
- Future: Optimization

*expanded knowledge = reduced hazards*

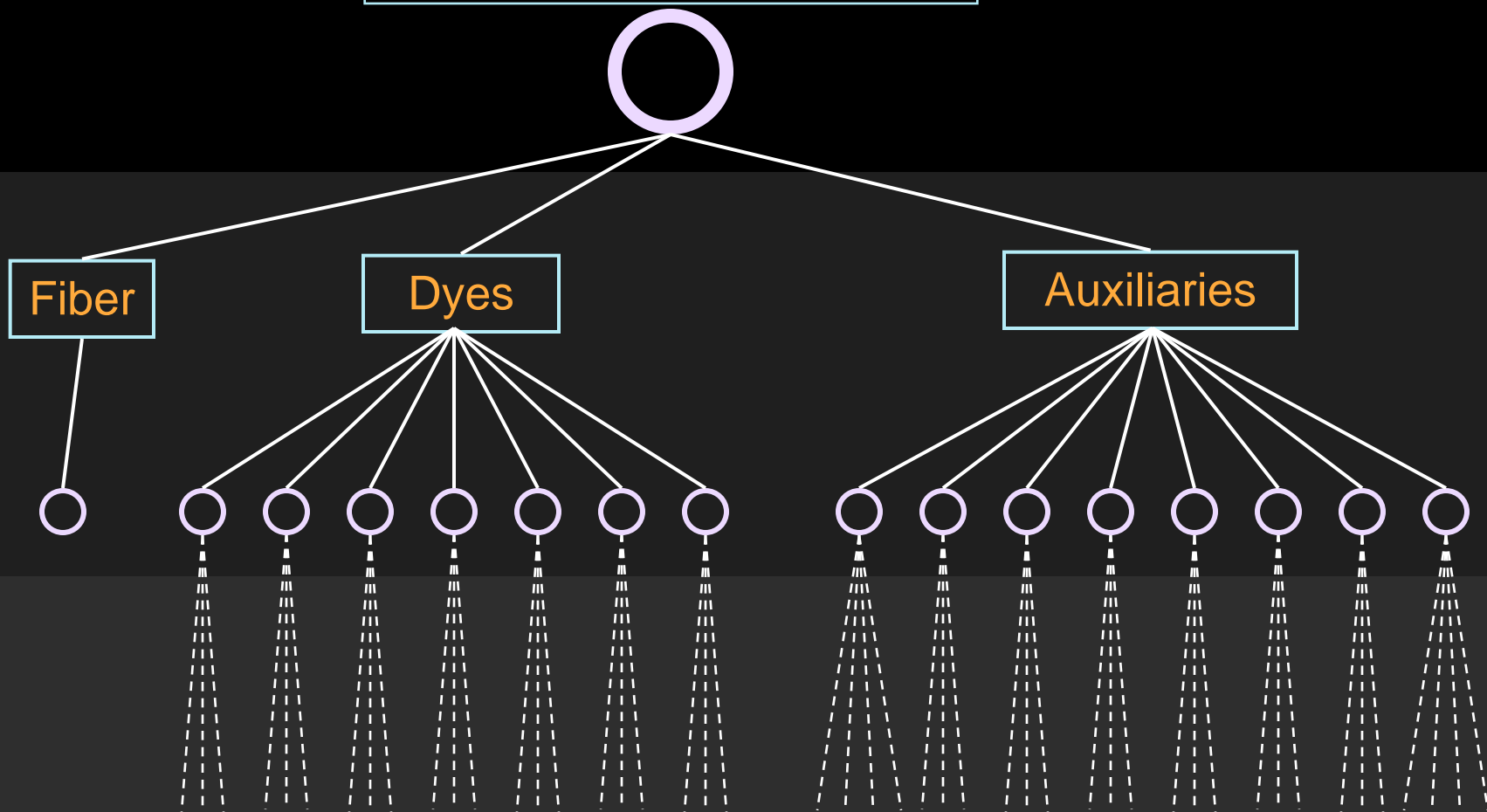
# Inventory

Product

Material

Chemical

# Textile Seating Fabric



Assessment

# Human Health Criteria

## Priority Criteria

- Carcinogenicity\*
- Disruption of Endocrine System\*
- Mutagenicity\*
- Reproductive Toxicity\*
- Teratogenicity\*

## Additional Criteria

- Acute Toxicity
- Chronic Toxicity
- Irritation of Skin/Mucous Membranes
- Sensitization
- Other (e.g., skin penetration potential, flammability, etc.)

\* Known or suspected in humans and/or animals

# Human Health Criteria

## Priority Criteria

- Causes cancer\*
- Mimics hormones\*
- Mutates chromosomes\*
- Causes reproductive harm\*
- Damages embryo/fetus\*

## Additional Criteria

- Immediately poisonous
- Poisonous through exposure
- Irritates skin/mucous membranes
- Induces allergic response
- Other (e.g., skin penetration potential; flammability)

\* Known or suspected in humans and/or animals

# Environmental Health Criteria

- Aquatic toxicity
  - Fish toxicity
  - Daphnia toxicity
  - Algae toxicity
- Bioaccumulation (BCF, log Kow)
- Climatic Relevance/Ozone Depletion Potential
- Content of Halogenated Organic Compounds
- Persistence/Biodegradation
- Toxic Heavy Metal Content
- Other (e.g., Water Danger Score, Toxicity to Soil Organisms, etc.)



# Environmental Health Criteria

- Aquatic toxicity
  - Poisonous to vertebrates
  - Poisonous to invertebrates
  - Poisonous to aquatic plants
- Stored in tissues & organs
- Climate change/Ozone depletion
- Halogens (F, Cl) + carbon = POPs & PBTs
- Does not breakdown in env./Reduces to organic-inorganic
- Toxic heavy metals (Pb, Hg, Cr, Cd)
- Other (e.g., Water Danger Score; Toxicity to Soil Organisms)

# Production Process

- Exact Knowledge of Composition
- Resources (Renewable/Nonrenewable)
- Transport Distance
- Energy Input
- Social Criteria
- Genetic Engineering
- Danger of Intermediates/By-Products
- Animal Testing
- Wastes
- Climatic Relevance/Ozone Depletion



PROVIDED BY McDONOUGH BRAUNGART DESIGN CHEMISTRY

## Partner Login

Email Address:

Password:

[Sign In](#)

Not a member?

[Create a new account](#)  
[Member Benefits](#)

[forget your password?](#)

## Cradle to Cradle Supply Chain Tool Overview



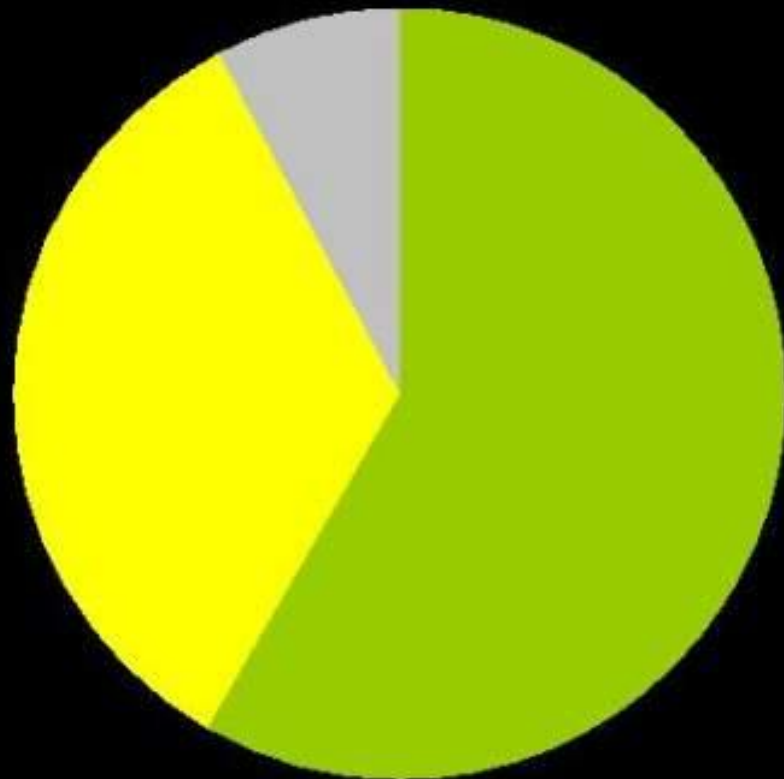
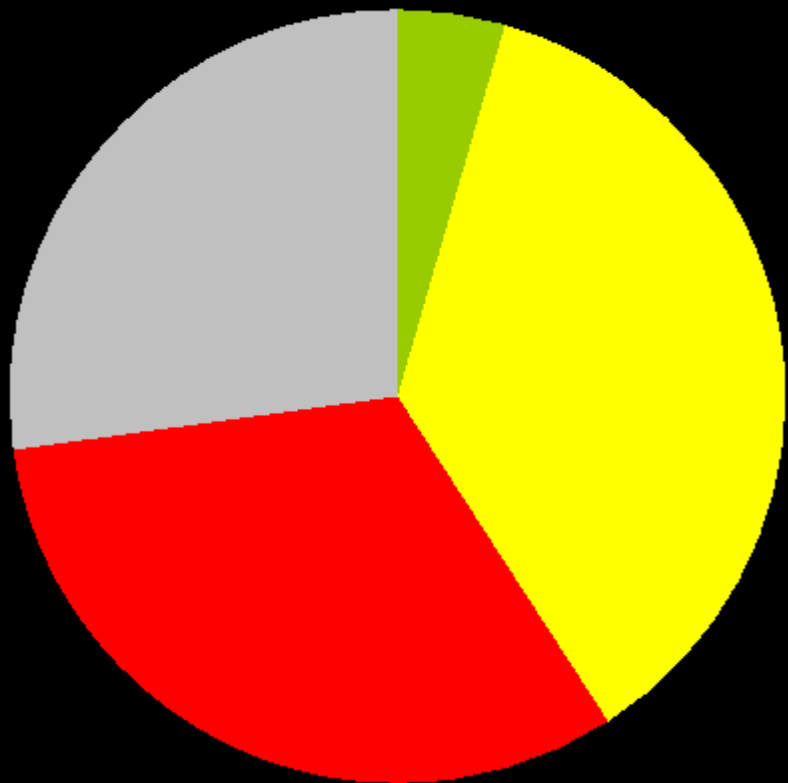
**The Supply Chain Tool...** MBDC's Supply Chain Tool is easy-to-use, web-based software to help companies efficiently inform their suppliers about new product design criteria, collect material formulation data, and compile it in a flexible database. This gathered data can be used by MBDC to assess, certify or optimize products and report research findings to a client and its suppliers.

MBDC (McDonough Braungart Design Chemistry) is a consultancy founded in 1995 by architect William McDonough and chemist Michael Braungart to reorient the design of products, industrial processes and systems to provide financial, environmental and societal benefits. MBDC and its co-founders have developed the innovative paradigm of Cradle to Cradle™ Design, widely recognized as the cutting edge in practical and profitable sustainable product development.

## What is Cradle to Cradle?

The Supply Chain Tool applies the paradigm of **Cradle to Cradle™ (C2C) Design**, which models human industry on the integrated processes of nature's biological metabolism—its productive ecosystems—by developing an equally effective technical metabolism, in which the materials of human industry safely and productively flow. Cradle to Cradle™ Design also seeks to optimize the following attributes of the manufacturing process: energy use quantity and quality (i.e., relative proportion of renewable energy), water use quantity, water effluent quality, and workplace ethics.

# Optimization



**preferred**



**acceptable**



**problematic**



**undefined**



for human &  
environmental  
health attributes



# Biological Nutrients





# Fabric Sale & Use

Fiber & Fabric  
Production



Disposal &  
Trimmings



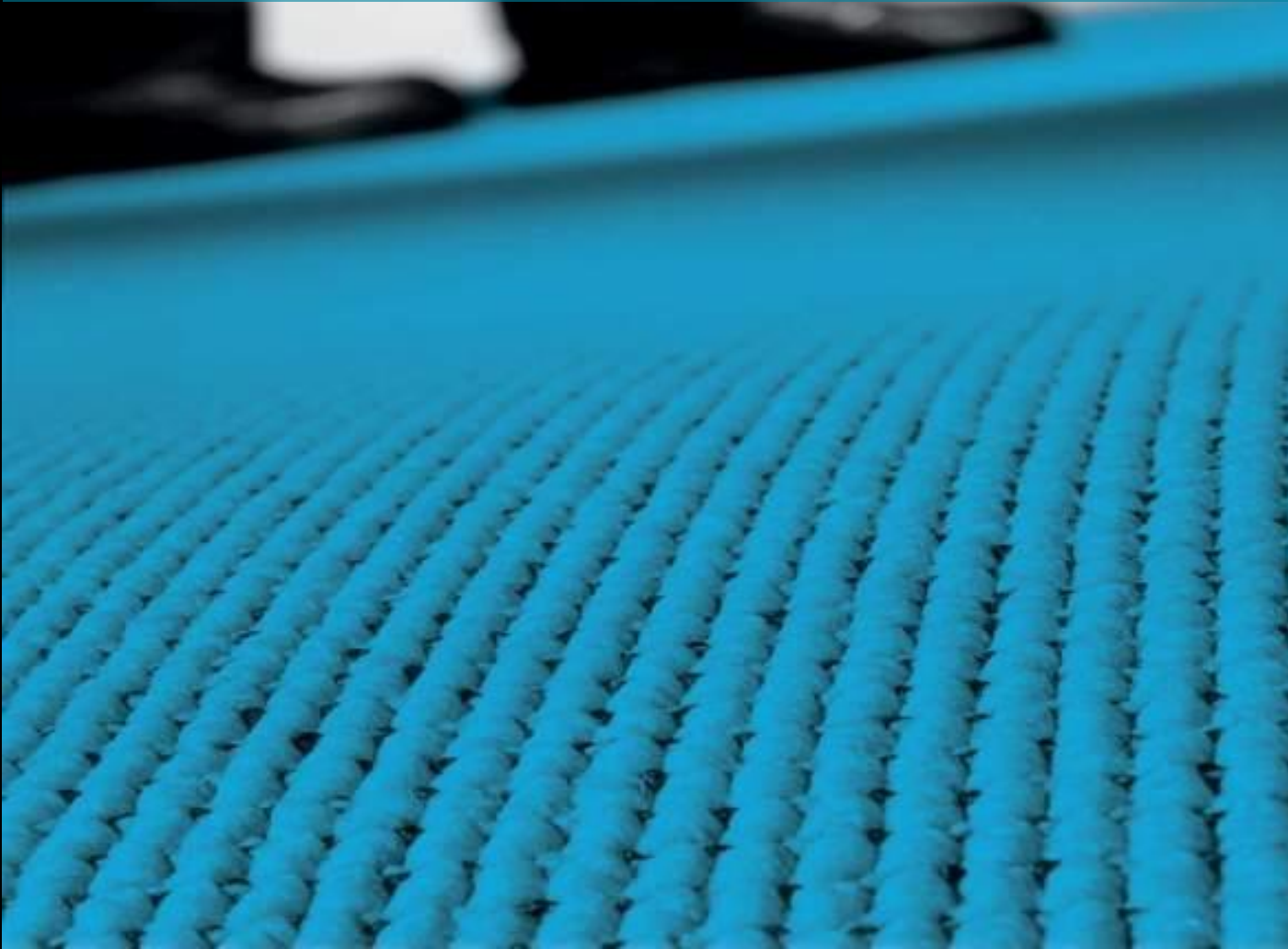
Mulch & Compost



Resource Growth



# Technical Nutrients



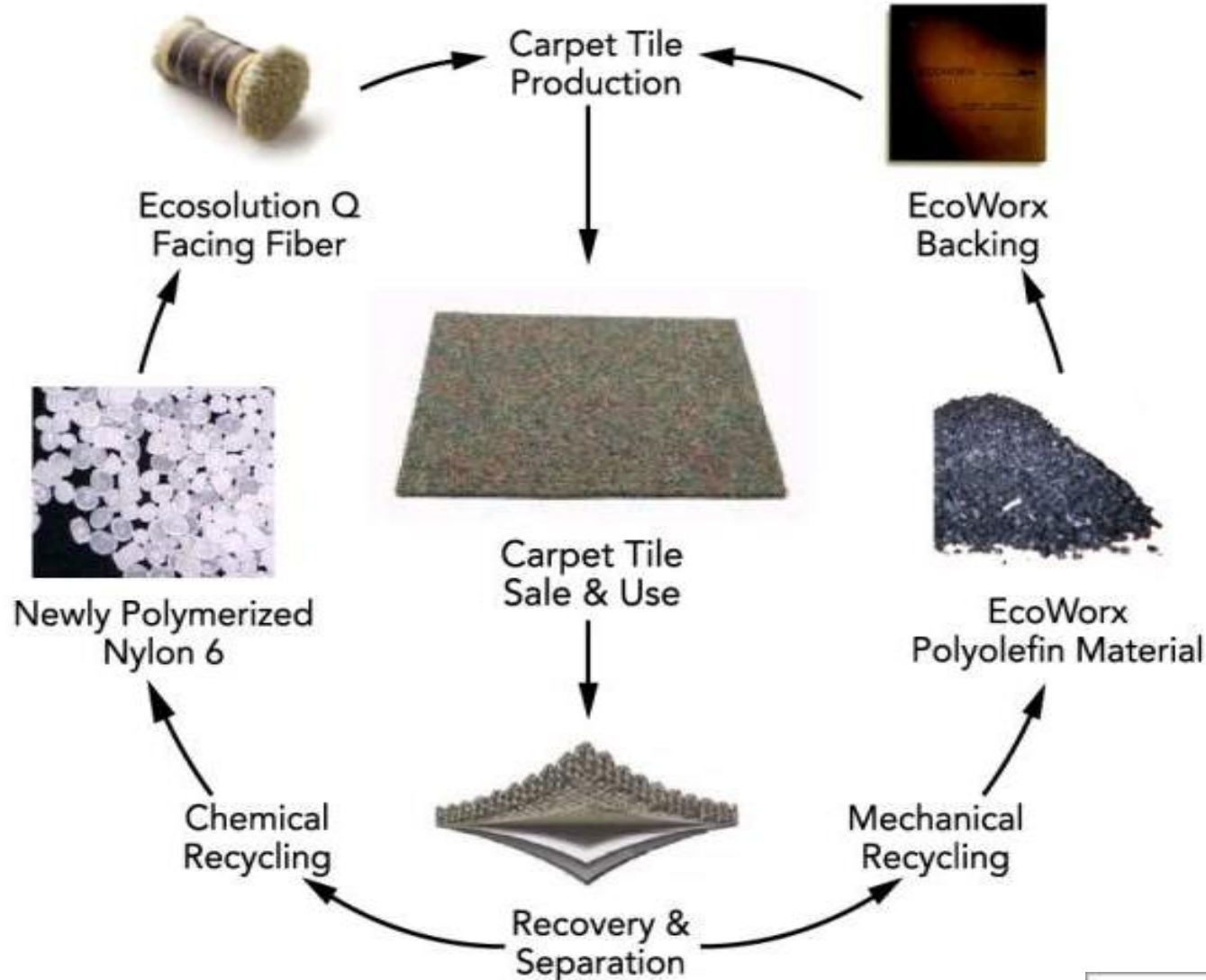




**Shaw**

Where Great Floors Begin®













Steelcase®



HAWORTH®



Herman Miller



# Cradle to Cradle<sup>SM</sup> Certification



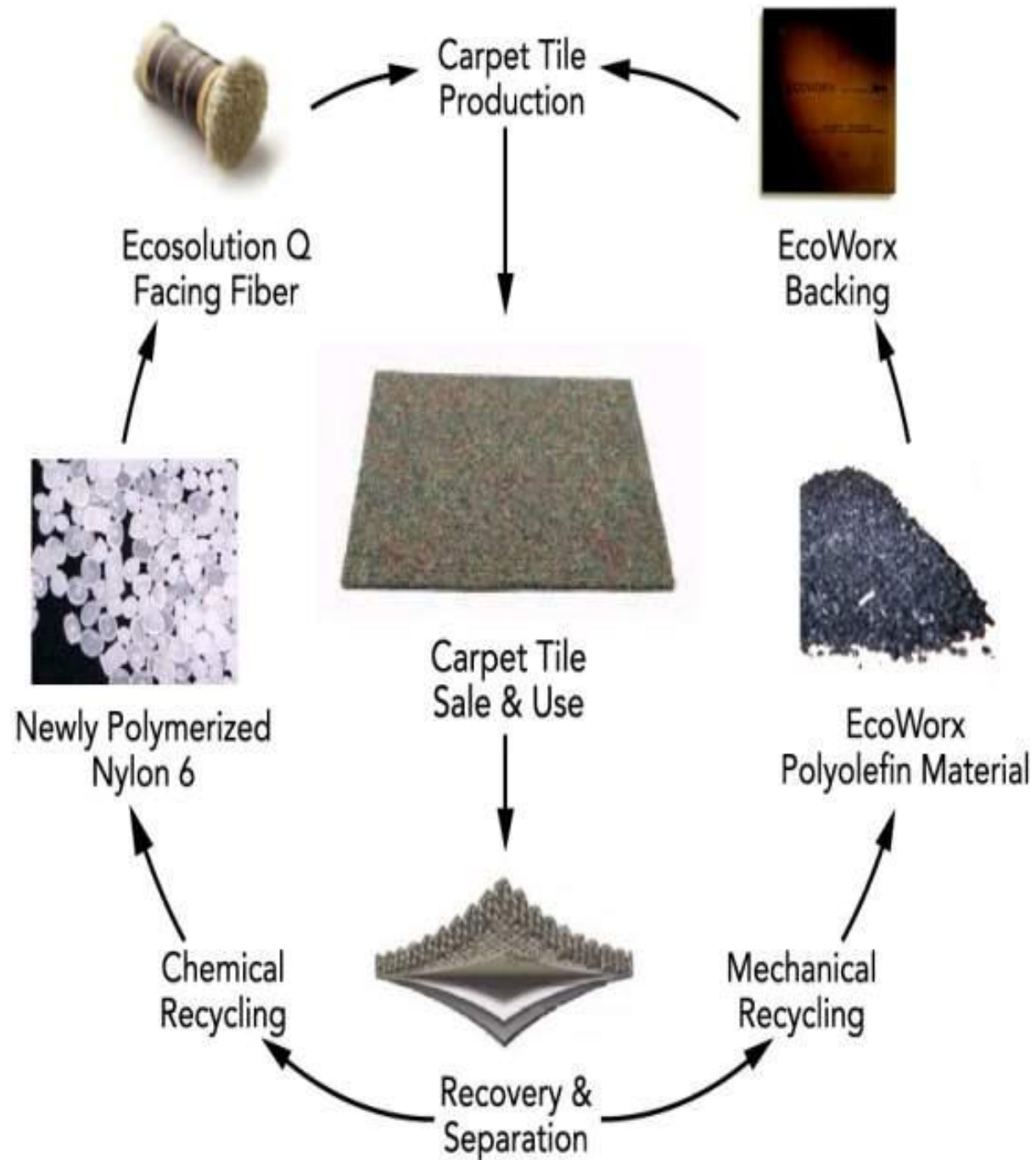


Are materials  
recyclable/  
compostable?

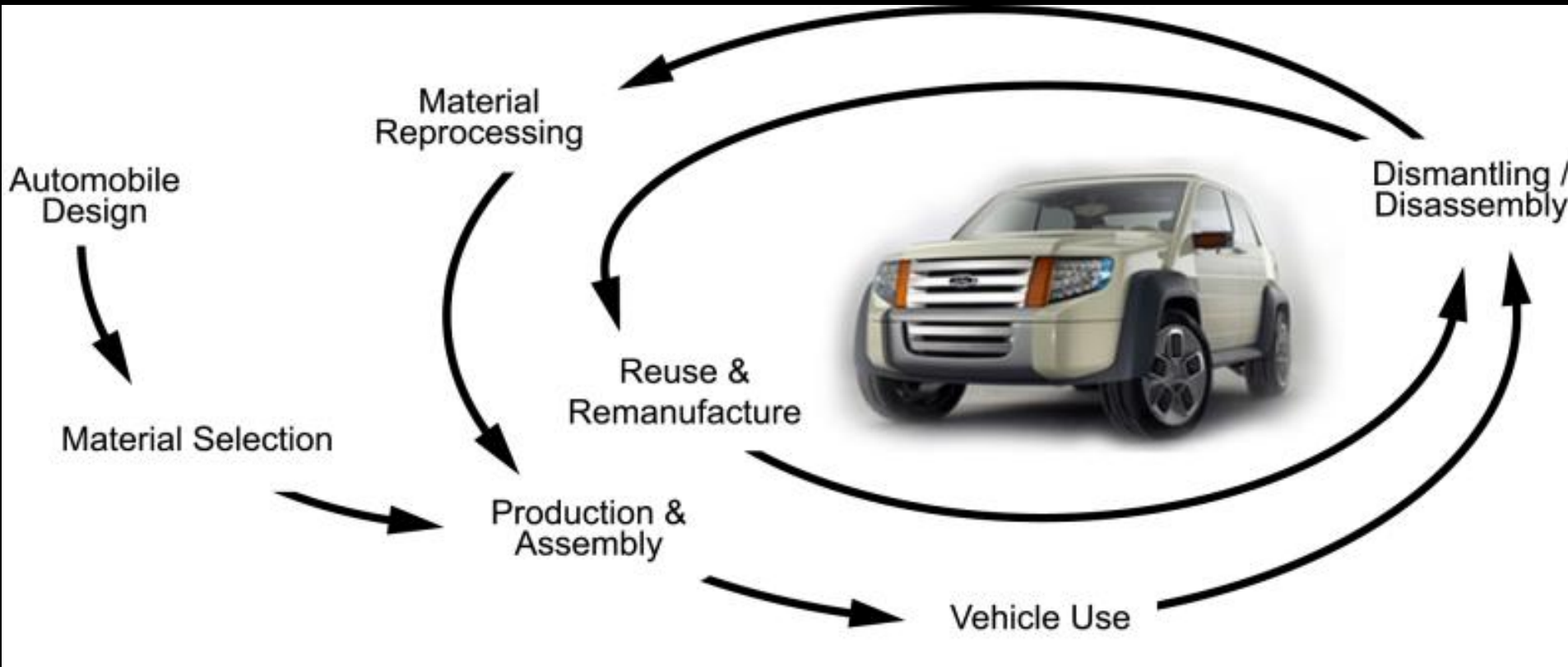




Do you have  
reverse  
logistics?



# Product of Service



Do you use  
renewable  
energy?



Is your water drinkable?





The image shows a bright, modern office or community space. On the left, a long wall of large windows provides natural light. In the foreground, a wooden foosball table stands on black legs. The middle ground is filled with people sitting at various tables, some working and others socializing. A large potted plant is on the right. The ceiling is high with exposed wooden beams and red pipes. A semi-circular yellow structure is visible in the background.

Are you providing social fairness?

PRIORITY MAIL  
UNITED STATES POSTAL SERVICE



FLAT RATE BOX  
PRIORITY MAIL  
POSTAGE REQUIRED  
REGARDLESS OF WEIGHT  
OR DESTINATION

# Flat Rate Box

For Domestic and International Use

## LIMITATIONS ON CONTENT:

When using Priority Mail, cash or cash equivalents and all hazardous materials are prohibited.

## WHEN USED INTERNATIONALLY 20 POUND WEIGHT LIMIT APPLIES

Additional country-specific prohibitions/restrictions may apply. See International Mail Manual (IMM) country pages for details.

## CUSTOMS:

For international use affix customs declaration PS Form 3810 using PS Form 3810-5 customs form pouch.

## HOW TO USE:



1. Complete Address Area  
Type or print required return address and address information in customer label area or on label.



2. Payment Method  
Affix postage or meter strip to area indicated in upper right hand corner.



3. Acceptance  
Bring your Flat Rate Priority Mail box to a Post Office or to schedule pickup of your postage paid packages visit us at [usps.com/flatrate](http://usps.com/flatrate)

From: Expeditor

To: Destination

Country of Destination: Page 26 destination



Green to Green Certification is awarded to products that possess an innovative design that minimizes the concept of waste. This USPS packaging has been certified for its material content, recyclability, and manufacturing characteristics.

Visit us at [usps.com](http://usps.com)



# California Prison Industry Authority

## Idea: Green Furniture Pilot



# Improve working conditions and products

## Training for the green economy

Products of service

Leverage the  
larger industry





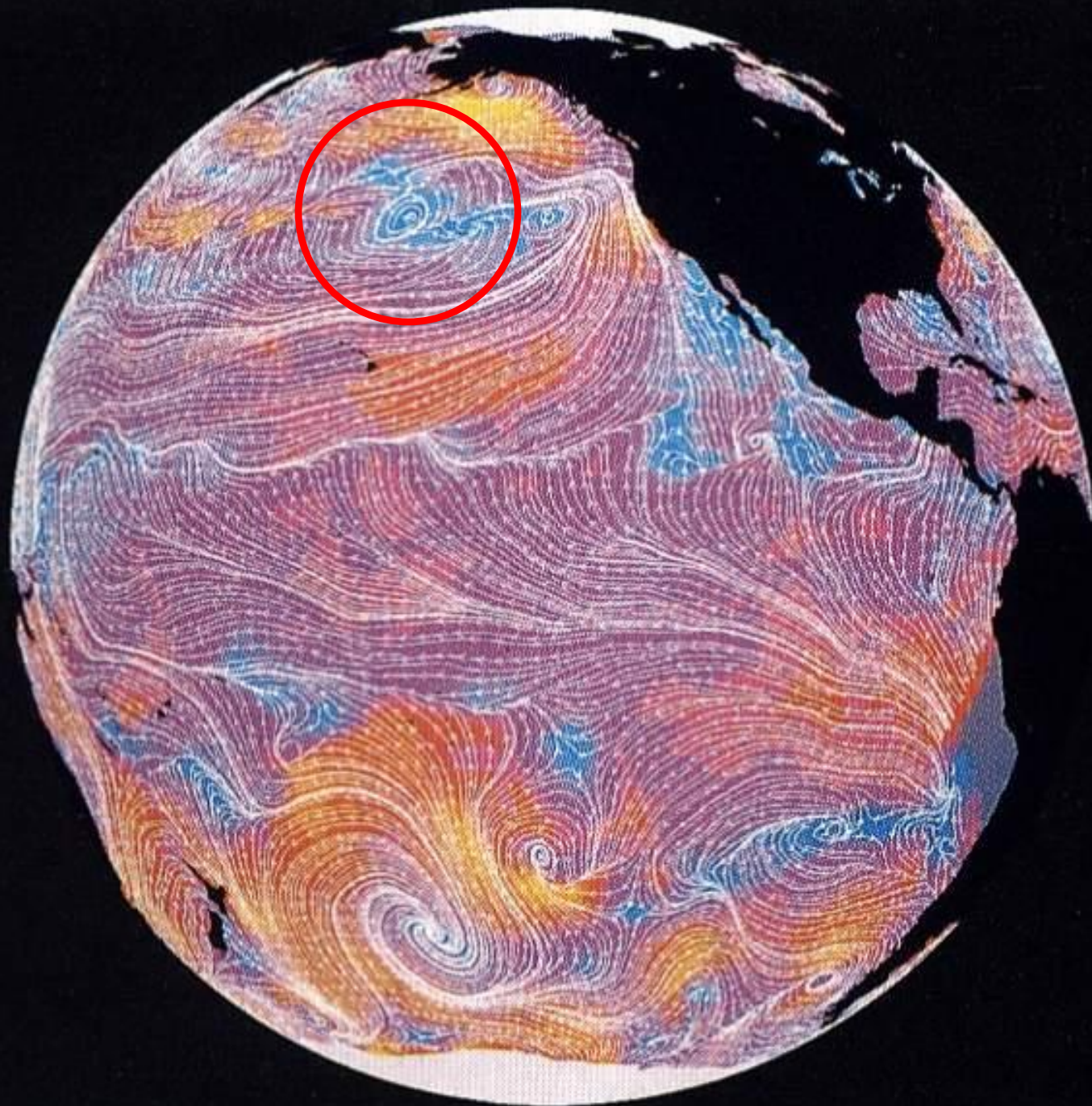
# California Recycling Beverage Containers

67% beverage container recycling rate (2007)

Leads the nation in total quantity of bottles  
and cans recycled: 14.7 billion







# Material & System Optimization

Biodegradable polymer, Stanford R&D

Methane feedstock

Improve bottle recovery and recycling

Return material assets to California industry

Imagine if the concept of  
waste went away in  
California?

# State of California Green Building Initiative

Goals for reducing energy use in state-owned buildings  
by 20% by 2015

Encourages commercial sector to set these goals

Establishes the Green Building Action Plan detailing  
measures to be taken by state to meet goals

Buildings like trees,  
Cities like forests













# Green Roof



Simple Payback: 8.8 years

**Provides High Thermal Resistance**

**Provides Acoustic Insulation:** attenuates sounds transmission by up to 50 Db (nearby airport)

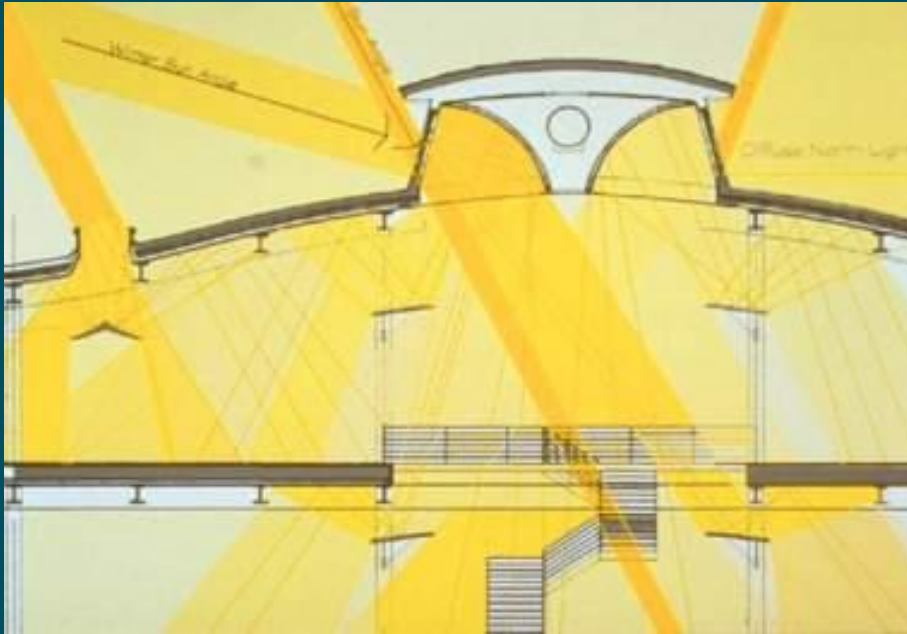
**Increases Roof Life**

**Expectancy:** roof membrane is protected from mechanical puncture, temperature extremes and UV degradation

**Saves Energy:** cooling effect of roof assembly lowers the cost of heating and cooling the building

**Creates Habitat:** native plant nursery

# Daylighting



Simple Payback: 5.9 years

**Reduced Energy Loads:** approx. 70% of lighting energy is saved in areas where daylighting is employed. In addition, electric lamp replacement and cooling loads are reduced.

**Increased Productivity:** Worker productivity has increased

**Reduced absenteeism:** Workers remain more alert, and are absent less, under natural lighting conditions.

# Indoor Air Quality – Raised Floor



## Payback Analysis:

Simple Payback: 3.5 years (2.6 for Plenum)

## Under floor HVAC System:

- Maintains temperature at occupant level, reducing cooling load 20%.
- Provides direct, superior ventilation, total economizer cycle
- Workers have complete control of their environments

## Operable Windows:

- Allows additional user control as well as possible “free cooling” from ventilation during much of the year.
- Total “churn” flexibility



















Imagine if all Californians had access to daylight and fresh air in their workplace?

# California Strategic Growth Plan

Rebuilding the State's  
infrastructure to accommodate  
projected growth.



# FORD ROUGE CENTER







## FORD ROUGE CENTER *storm water strategies*



## FORD ROUGE CENTER *storm water strategies*



## FORD ROUGE CENTER *storm water strategies*





# FORD ROUGE CENTER *ecological infrastructure*

**Trees**



**Shrubs**



**Ground cover**













# FORD ROUGE CENTER *business case*

## **Cost of Conventional System**

**\$50,000,000**

*Includes costs for meeting regulatory requirements,  
which dictated the construction of an onsite treatment plant  
for dealing with large storm water events*

## **Cost of Installed System**

**\$15,000,000**

*All storm water is cleaned through natural filters,  
eliminating the need for regulatory requirements*

## **Savings**

**\$35,000,000**

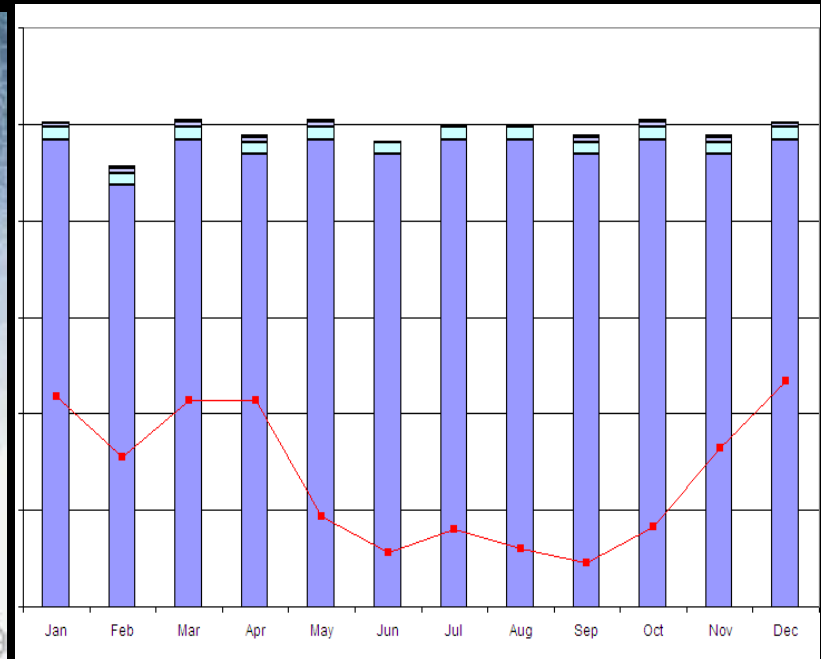
*Calculated from straight costs alone and does  
not account for energy and operational savings*

Imagine if there were less  
pipes?

# HALI'IMAILE Concept, Maui, Hawaii



# HALI'IMAILE Concept, Maui, Hawaii



# HALI'IMAILE Concept, Maui, Hawaii

## Inputs

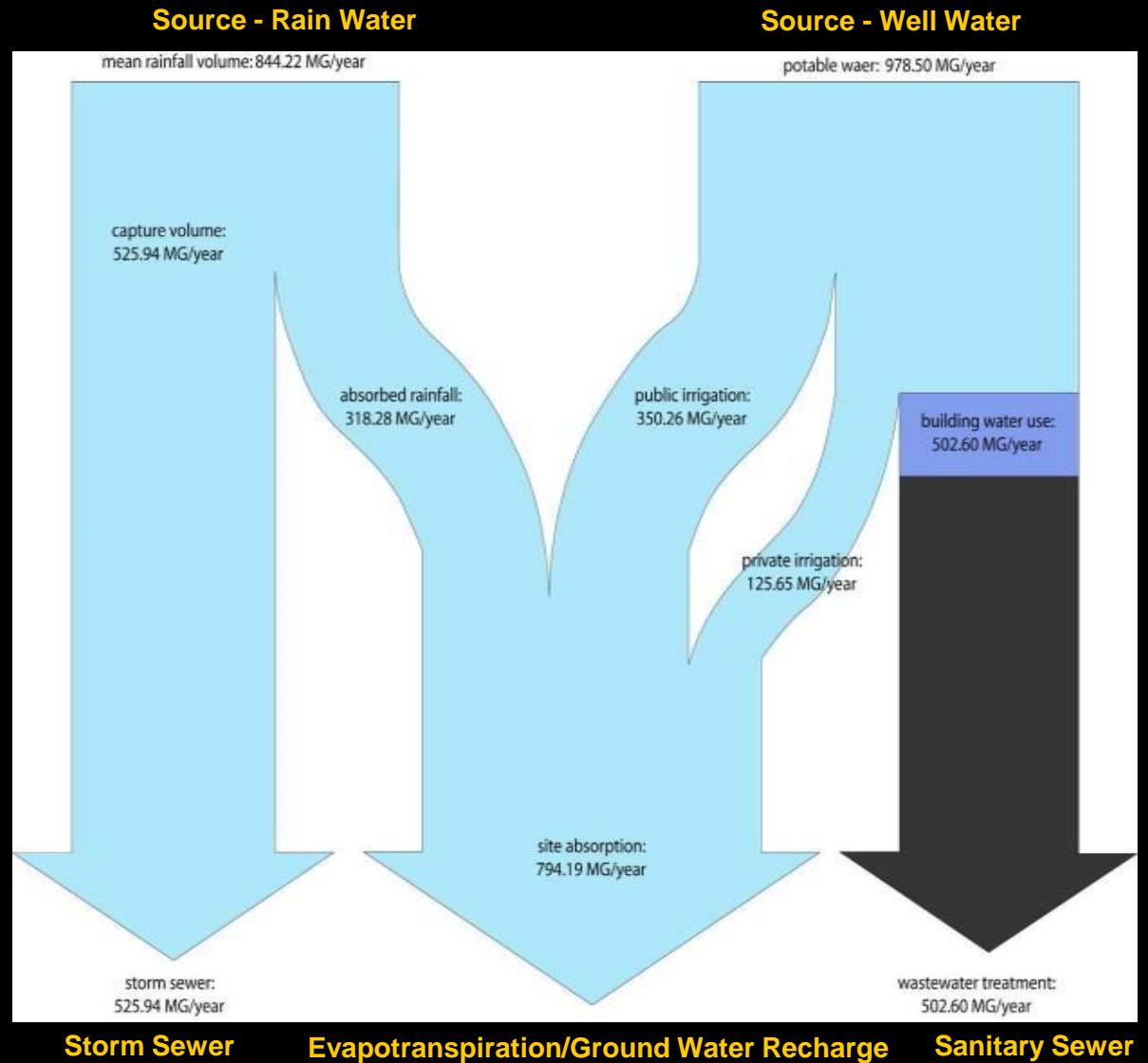
**844.22 million gallons** of rainfall per year

**978.5 million gallons** of well water for potable and non-potable use

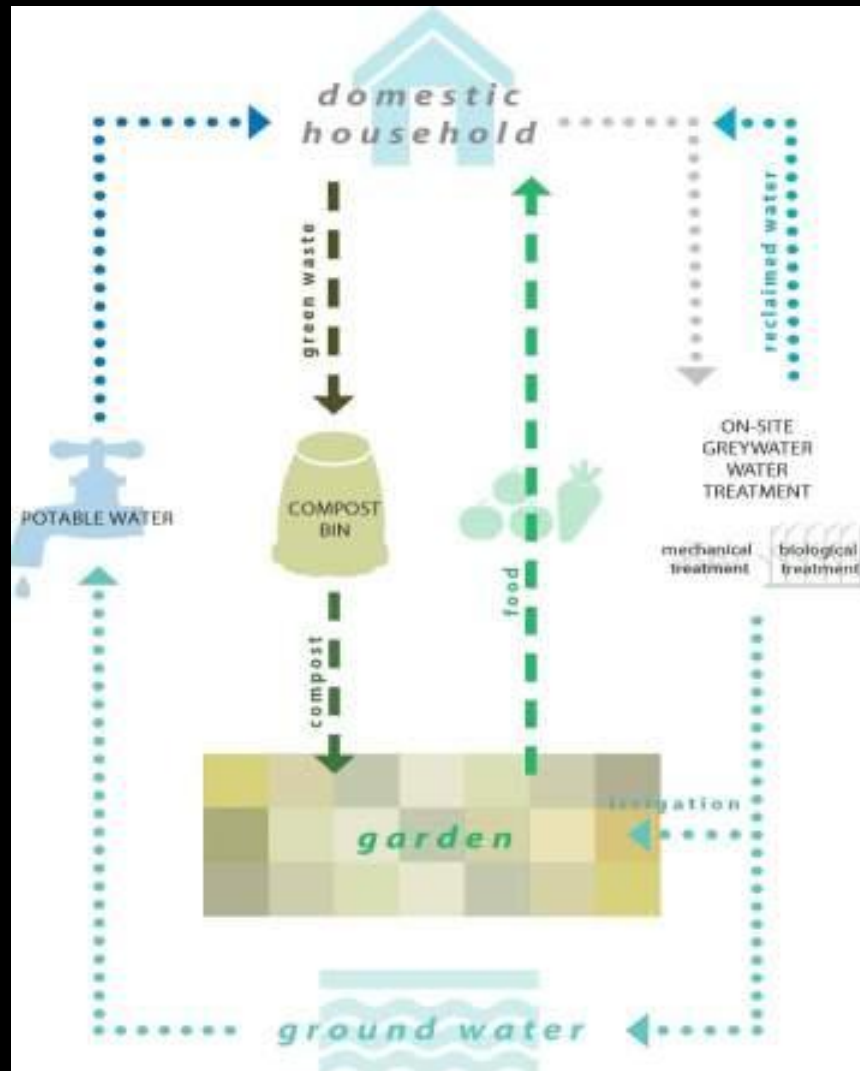
## Outputs

**502.6 million gallons** to sanitary sewer

**525.94 million gallons** to storm sewer

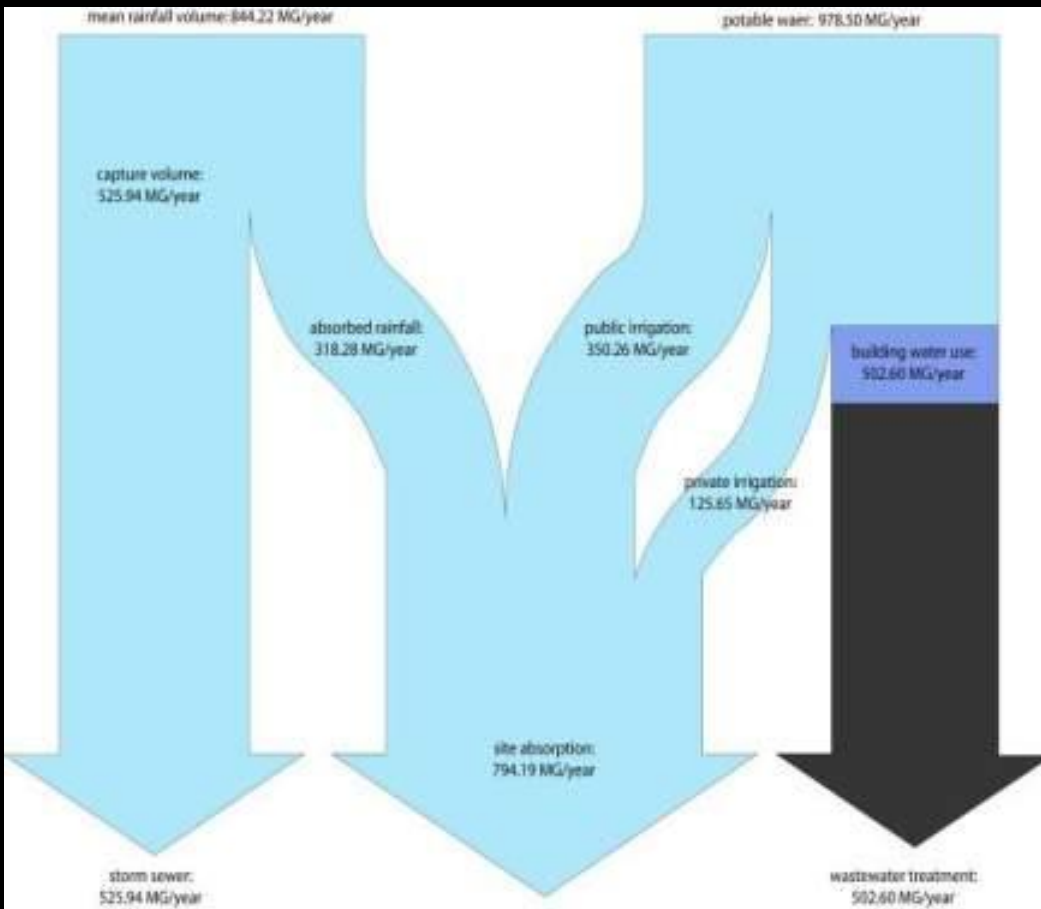


# HALI'IMAILE Concept, Maui, Hawaii

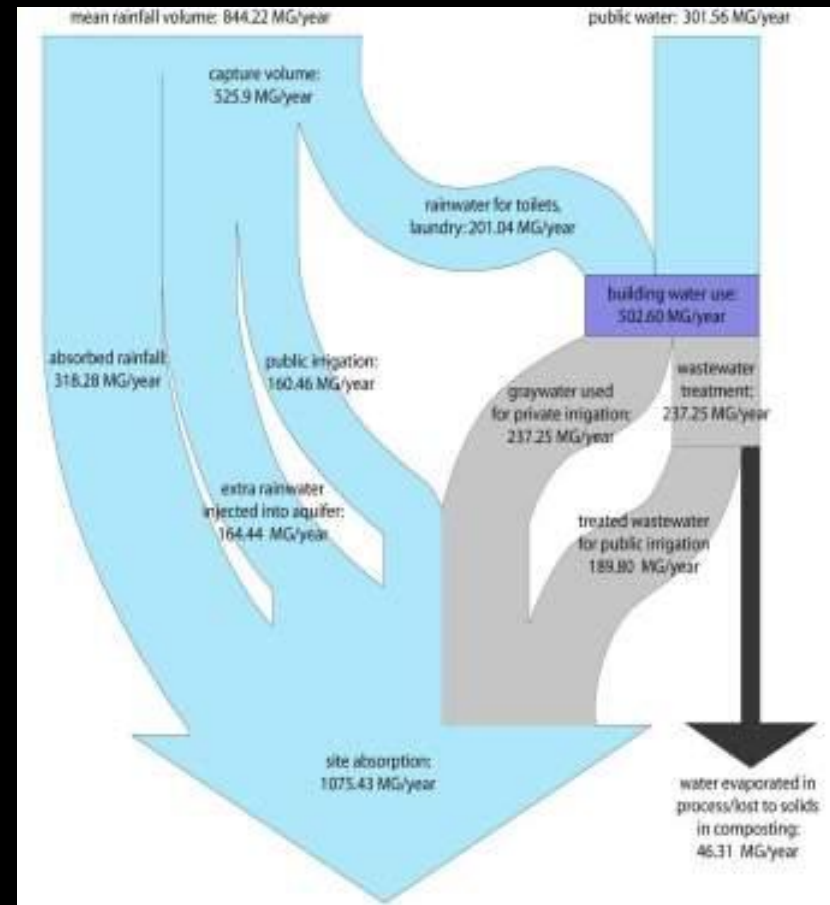




# HALI'IMAILE Concept, Maui, Hawaii



**Conventional Water Budget**

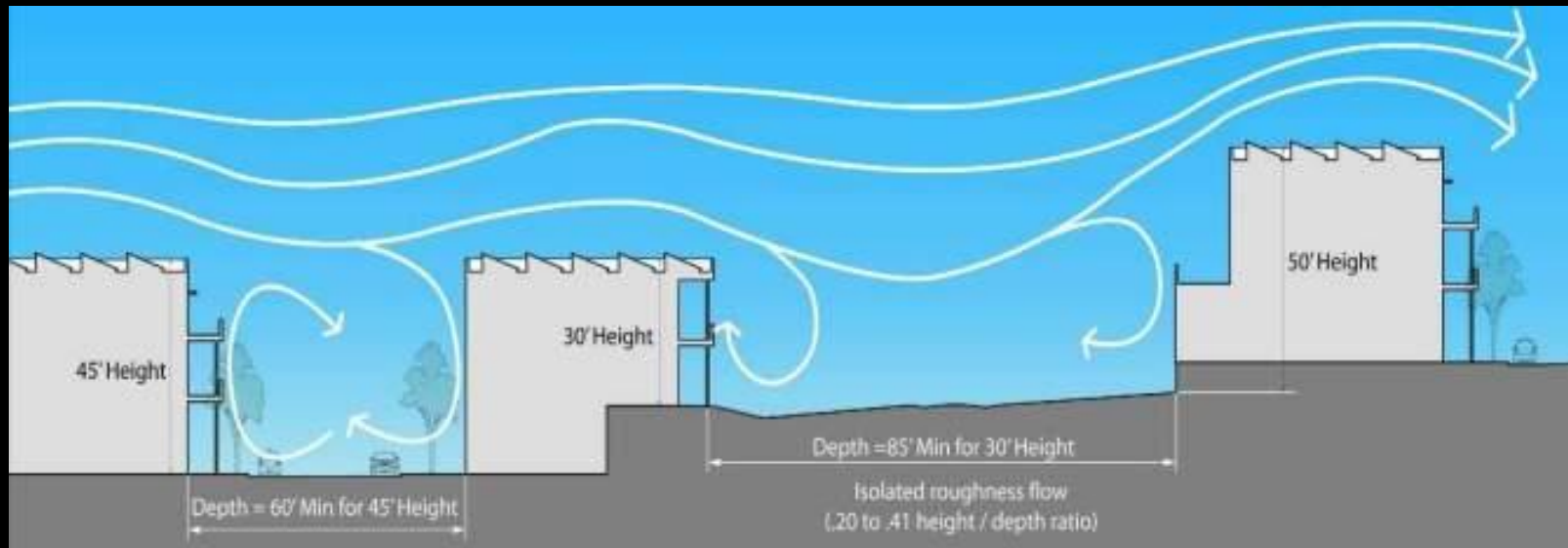


**Optimized Water Budget**

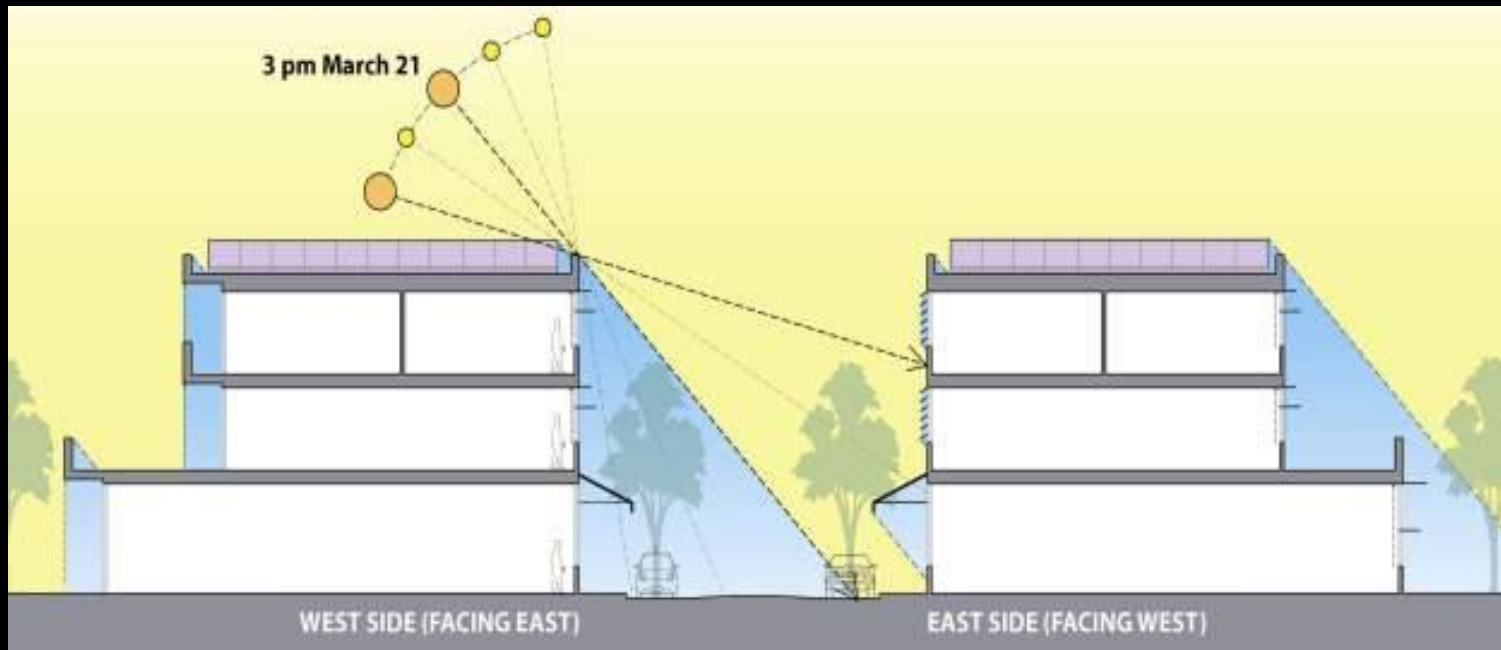
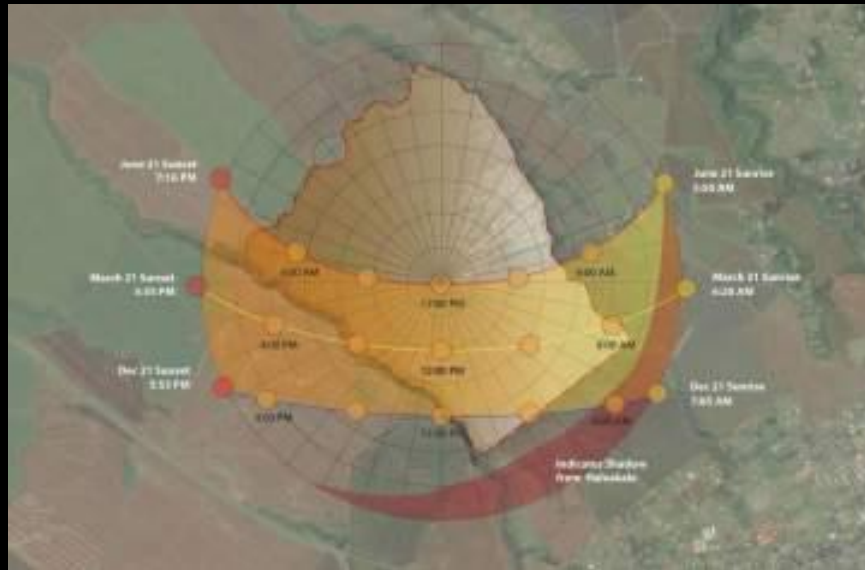
## Comparative Analysis

- 70% reduction in well water use
- 90% reduction in sanitary water output
- nutrient recapture
- 100% reduction in SW effluent

# HALI'IMAILE Concept, Maui, Hawaii



# HALI'IMALE Concept, Maui, Hawaii



# HALI'IMALE Concept, Maui, Hawaii



Neighborhood Block Orientation for Optimal Passive Energy Strategies

*Reduction in CO<sup>2</sup> Emissions when Housing Energy Strategies are Extrapolated Community-wide*

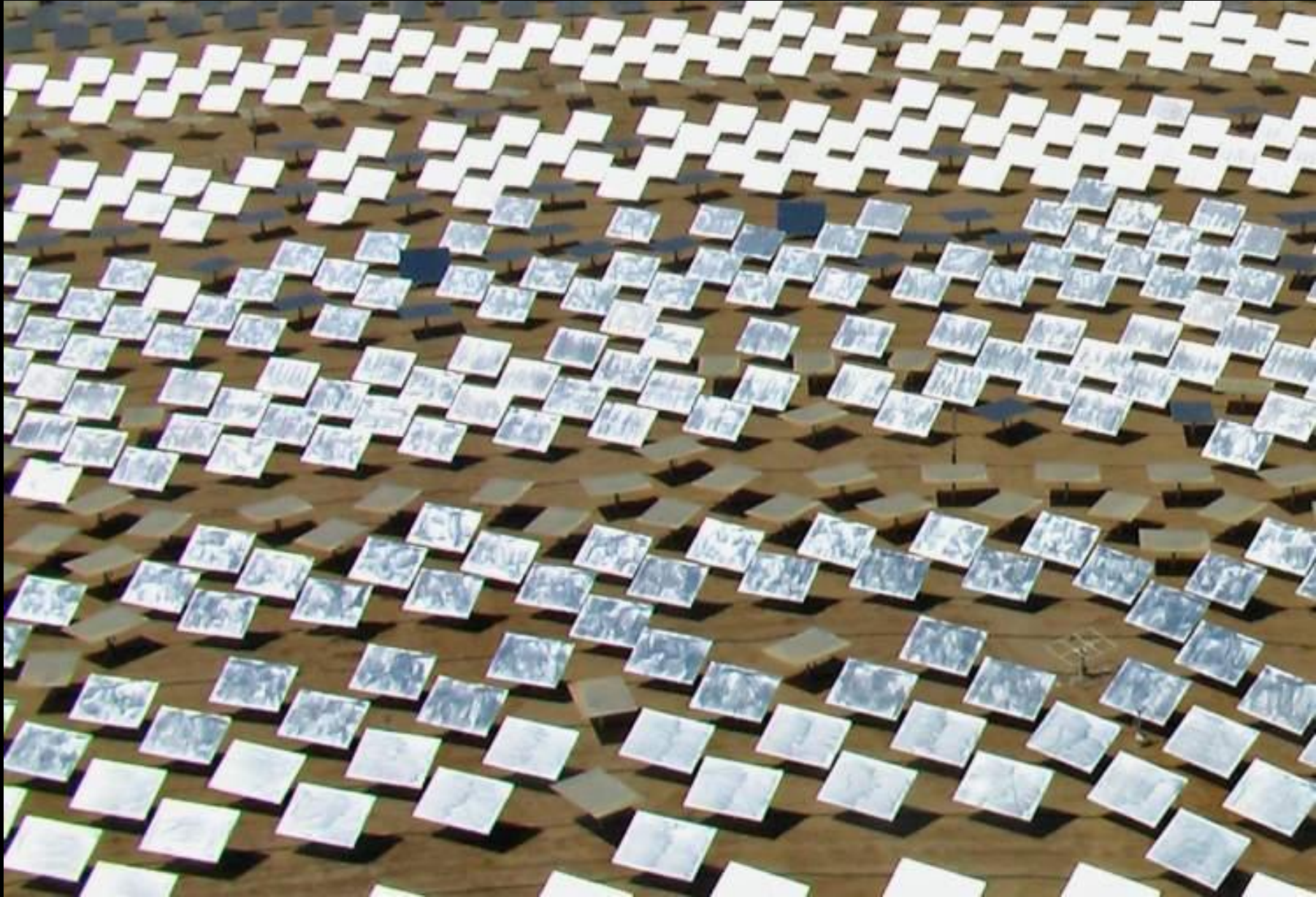
*Base Case housing = 3,596,613 kg CO<sup>2</sup>/m<sup>2</sup>/y*

*Optimized Case housing = 2,945,032 kg CO<sup>2</sup>/m<sup>2</sup>/y*

*CO<sup>2</sup> Emissions reduced 18%*



# BrightSource Energy



# BrightSource Energy





# Better Place

electric  
car



better place



battery exchange  
stations

China will house hundreds of millions in the next 10 years



Liuzhou



# Site

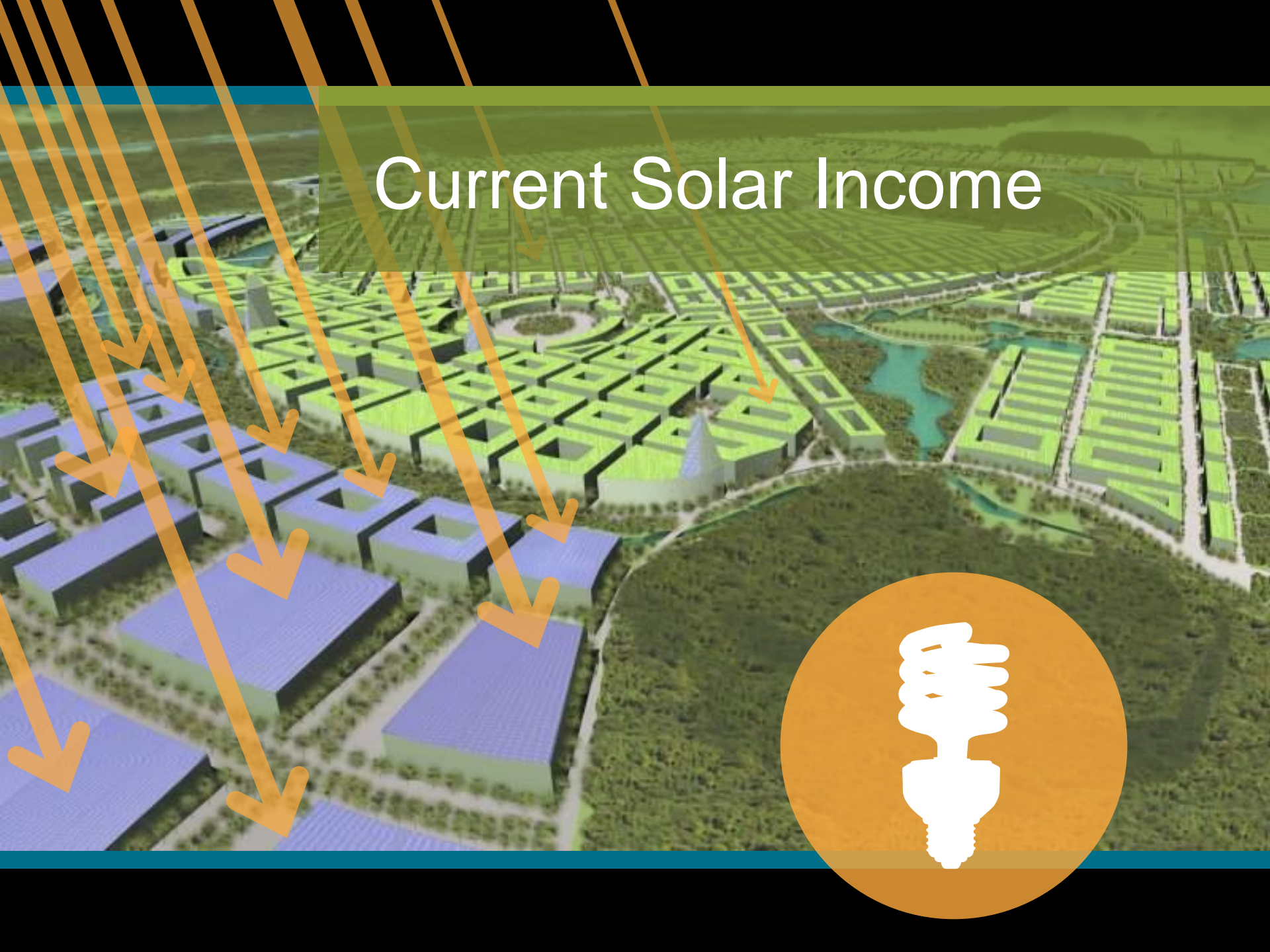




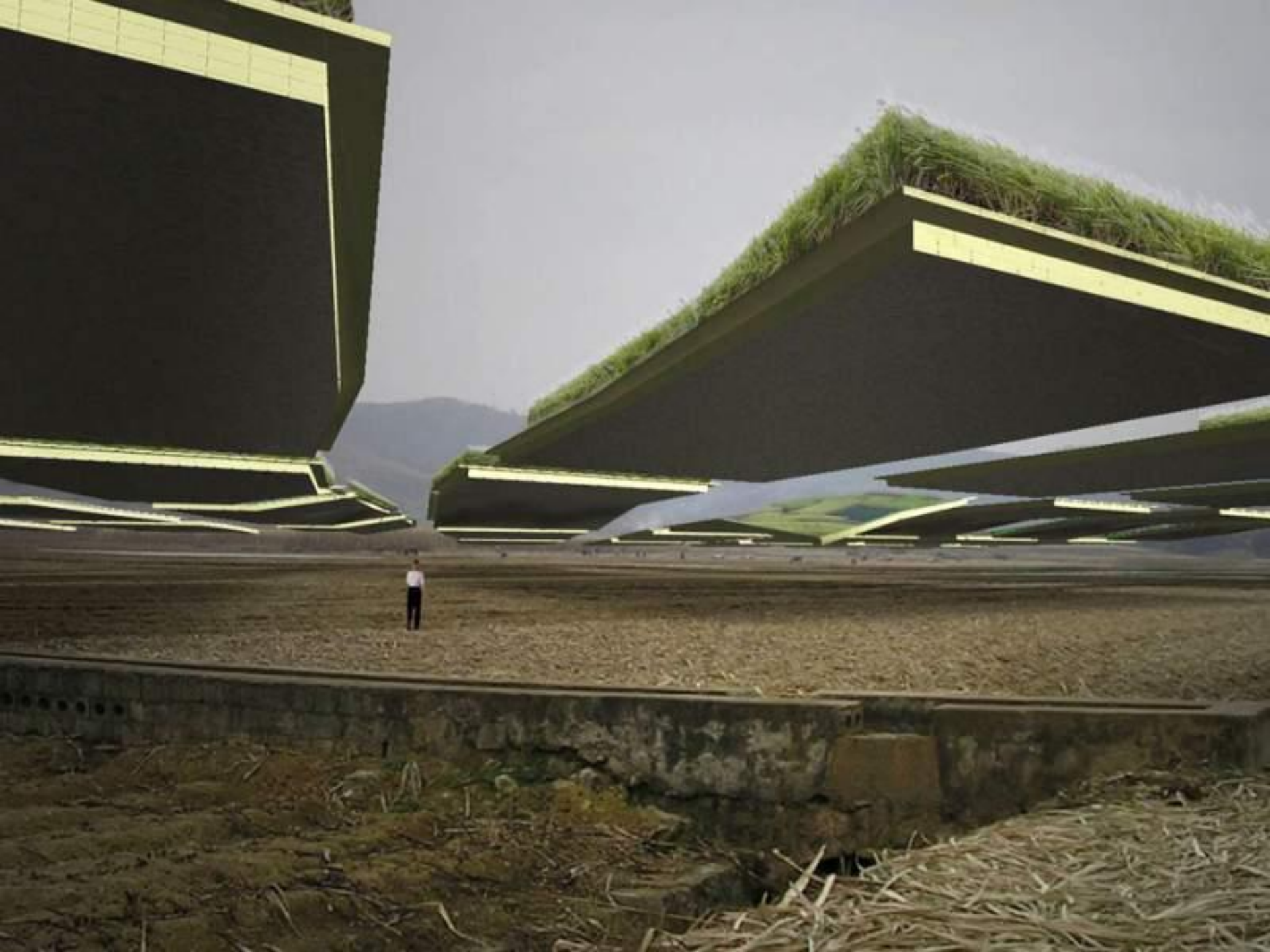
Waste = Food



# Current Solar Income















What is our intention as a species?

Our goal is a delightfully diverse, safe, healthy and just world, with clean air, water, soil and power — economically, equitably, ecologically and elegantly enjoyed.



How do we love all the children of  
all species for all time?